

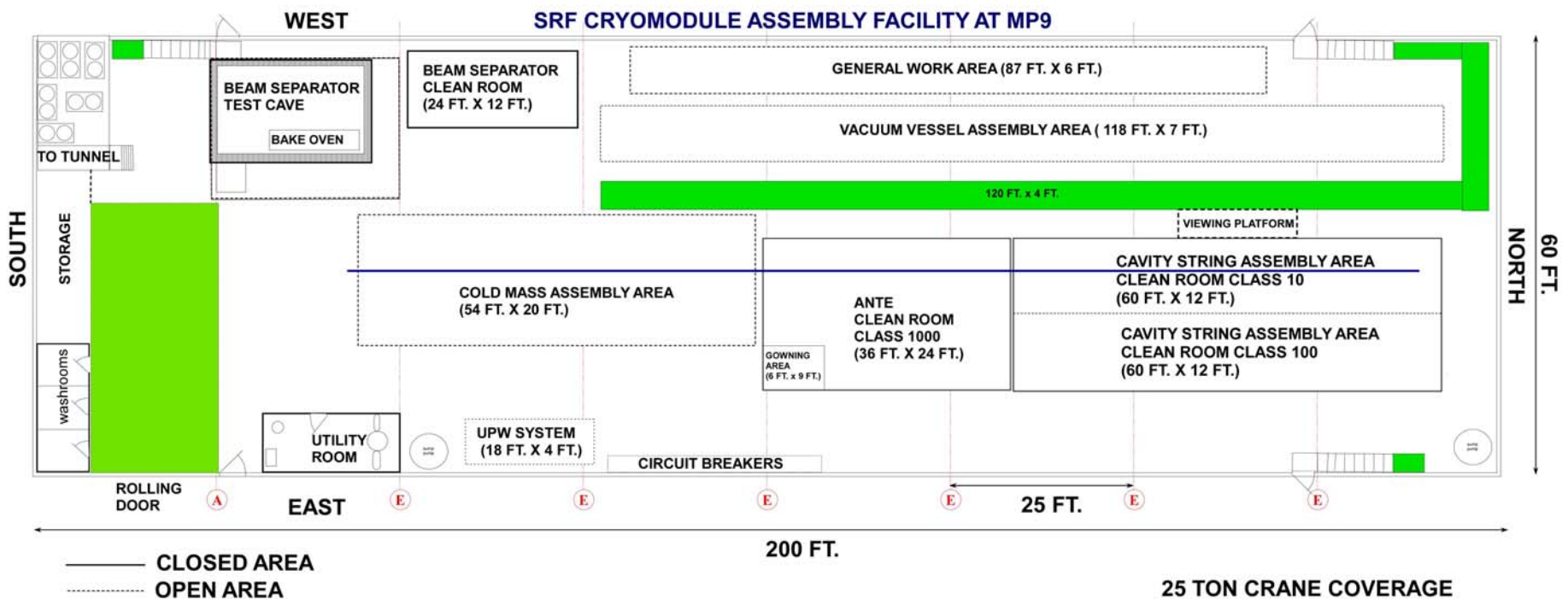
Cryomodule Assembly Facility (CAF) Setup Status

Tug Arkan

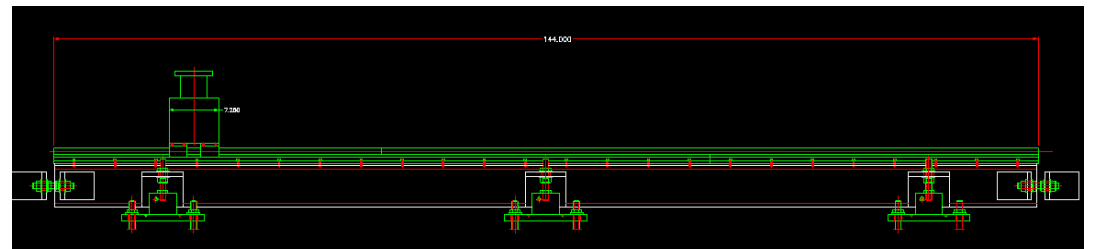
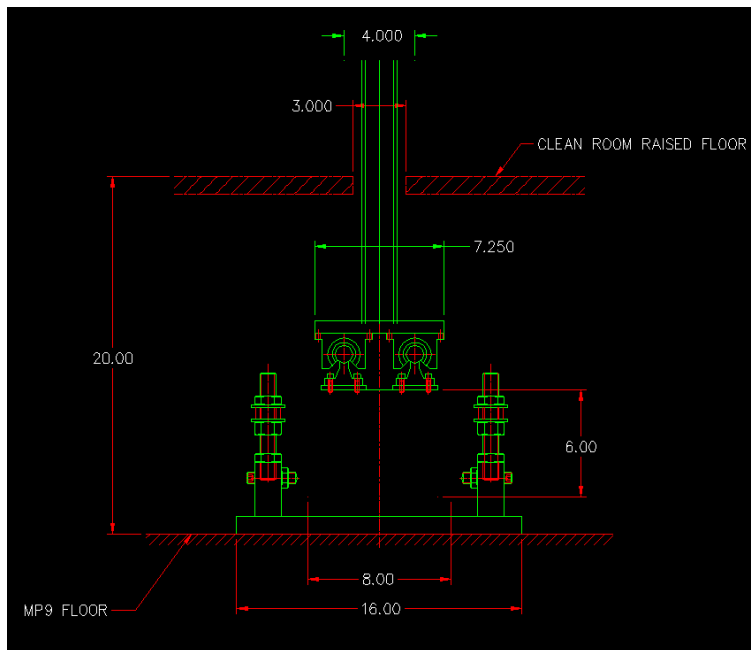
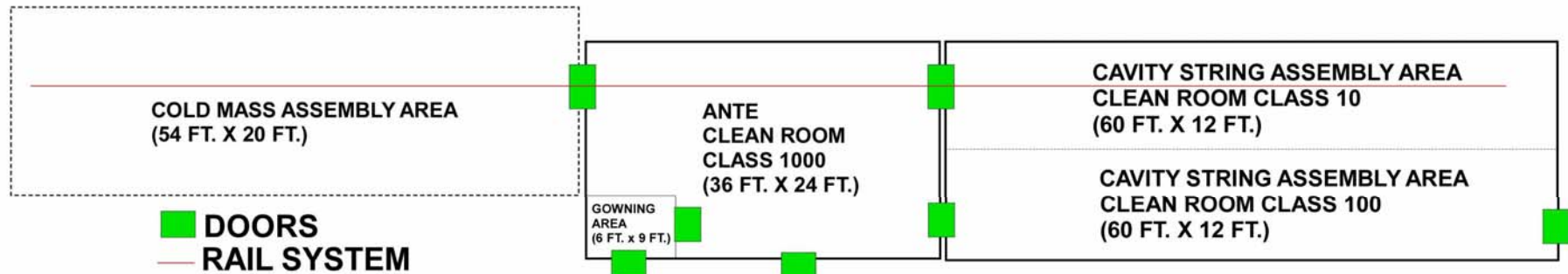
November 9, 2005

CAF Infrastructure Plans at MP9

1.3 GHz Elliptical Cryomodules Assembly Facility (CAF) Infrastructure at MP9



Cavity String Assembly Clean Room Doors and Rail System





Cryomodule Assembly Workflow Plans

- Assumptions for the assembly of two 1.3 GHz Elliptical cryomodules: (*R&D production rate*)
 - SRF bare cavities are fabricated in industry. (Form/machine parts, electron beam welding)
 - Cavities are processed (tuned for field flatness, baked, chemical etched {BCP and/or electro-polish}, high pressure water rinsed and vertical dewar tested).
 - Cavities are outfitted with helium vessel and input power coupler and further dressed (tuner, magnetic shielding) for the horizontal dewar test.
 - It is assumed that these steps (processing & dressing) are carried out elsewhere (collaborating laboratories, universities).
 - After passing horizontal dewar test, the cavity with helium vessel and cold part of the input coupler is shipped sealed to the Cryomodule Assembly Facility (CAF).
 - The sealed cavities with cold input coupler are received at CAF for incorporation into cryomodules.
 - 8 dressed cavities are assembled into a string at CAF clean rooms.
 - The cavity string is then assembled into cold mass.
 - Cold mass is then inserted into vacuum vessel and the cryomodule assembly is complete.

Receive dressed
Cavities

Receive peripheral (vacuum
vessel, cryogenic pipes, super-
insulation etc.) Cryomodule Parts



Assemble
dressed Cavities
to form a String in
the **Cavity String
Assembly Area**
(Clean Room)



Install String Assembly to
Cold Mass in the **Cold Mass
Assembly Area**





Install the String assembly with the cold mass into the Vacuum vessel in the **Vacuum Vessel Assembly** area

Ship completed cryomodules to **HPTF**

Cryomodule Testing at **HPTF**

pass

Cyomodule production is successful

fail

Send the Cryomodule back for repair

Cavity Repair

Cryomodule Repair
(assumes one or more cavities must be replaced)

- Disassemble the module

- Disassemble the string in the Clean Room

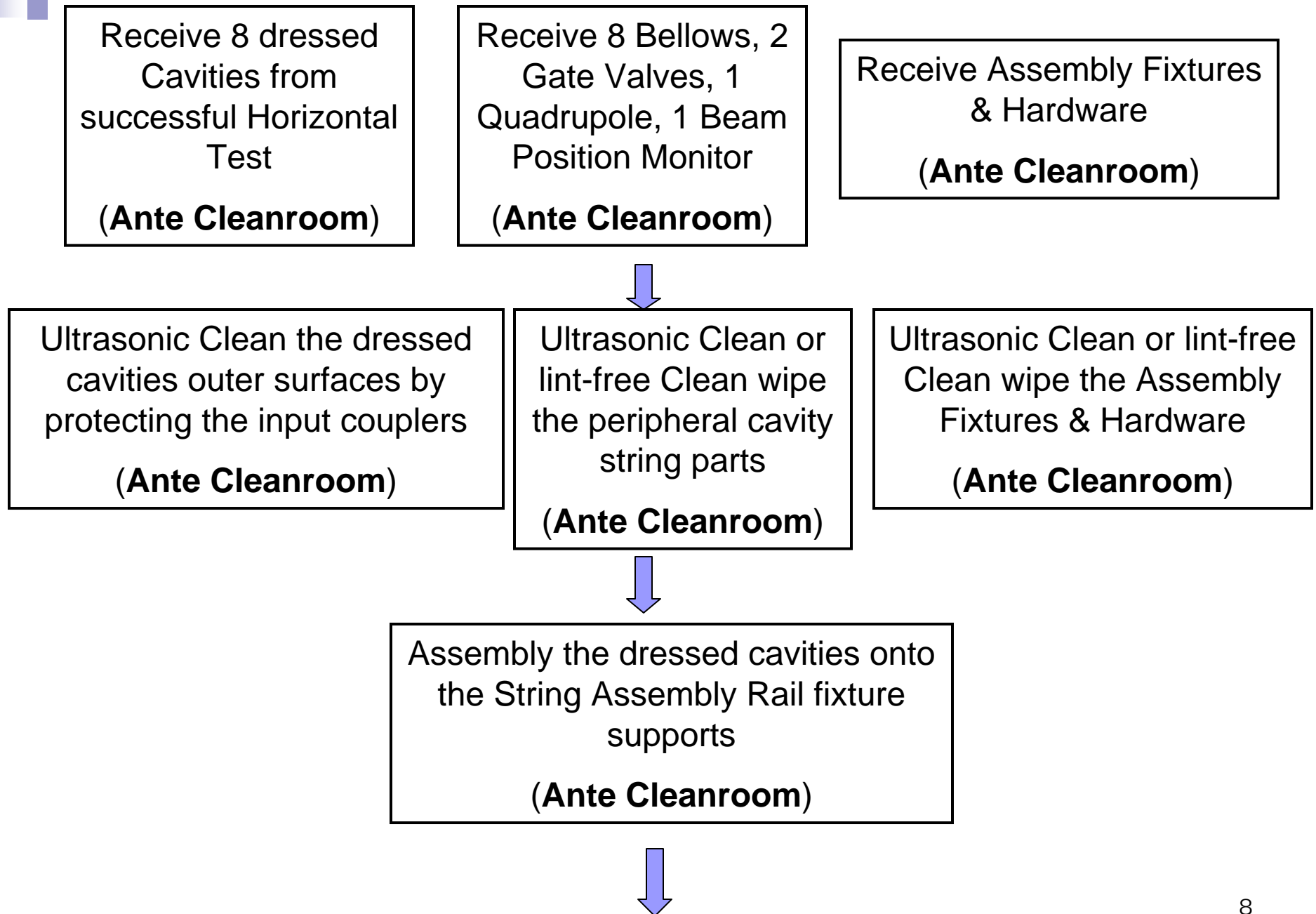
- Install a new dressed cavity to the string



Cavity String Assembly Workflow at the Cleanrooms

- Inside the class 100 / class 10 cleanroom eight cavities, two gate valves, eight bellows, one quadrupole and one beam position monitor are assembled on a cavity string assembly rail system.
- They are pre-cleaned and ready for assembly at the Ante Cleanroom.
- Each of the eight cavities is sealed with flange and antenna connections and the interior surface of the cavities are under ultra high vacuum conditions.
- The sequence of assembly starts with connection of the first cavity (beam pipe long side) and one gate valve. The opposite side (beam pipe short) is connected to one bellows, which serves as the vacuum tight and flexible interconnection to the next cavity in line.
- Cavity no 8 is connected to the beam position monitor. This monitor is connected to the quadrupole and the second gate valve. This subunit is a separate assembly unit which has to be completed inside the clean room before this unit is connected to the cavity string.
- During all assemblies the particle contamination of the individual components as well as that of the sub units after the assembly procedure is monitored.
- Inside the clean room the most important alignment is the horizontal positioning of the cold part of the input coupler with respect to the vertical plane parallel to the beam axis and in respect to each other. After fixation of the bellows the cavities are rigidly connected to each other with respect to rotational positioning and no readjustment afterwards is possible.

Work Flow at CAF Clean Rooms



Work Flow at CAF Clean Rooms

Transport 8 Cavities into the Class 10 Clean Room with the String Assembly Rail Fixture



Vent and then Connect the 1st Cavity (beam pipe long side) to the Gate Valve
(Class 10 Cleanroom)



Connect the 1st Cavity (beam pipe short side) to the Bellow
(Class 10 Cleanroom)



Connect the 2nd Cavity (beam pipe long side) to the Bellow which was already connected to the 1st Cavity
(Class 10 Cleanroom)

String Assembly Complete



Connect the Sub-Unit to the Interconnected 7 cavities String
(Class 10 Cleanroom)

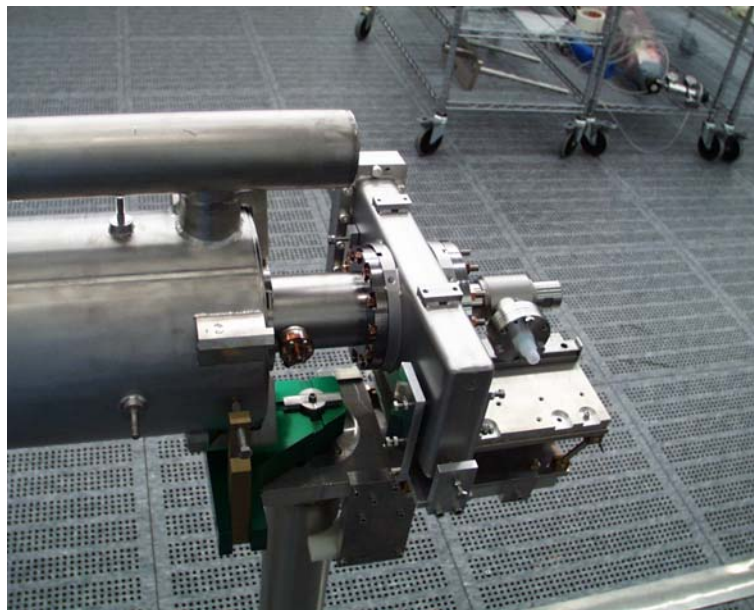
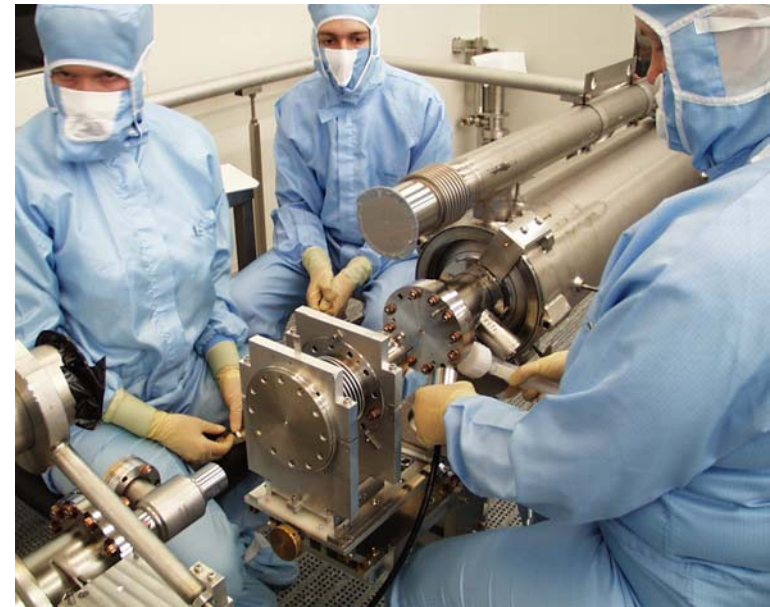
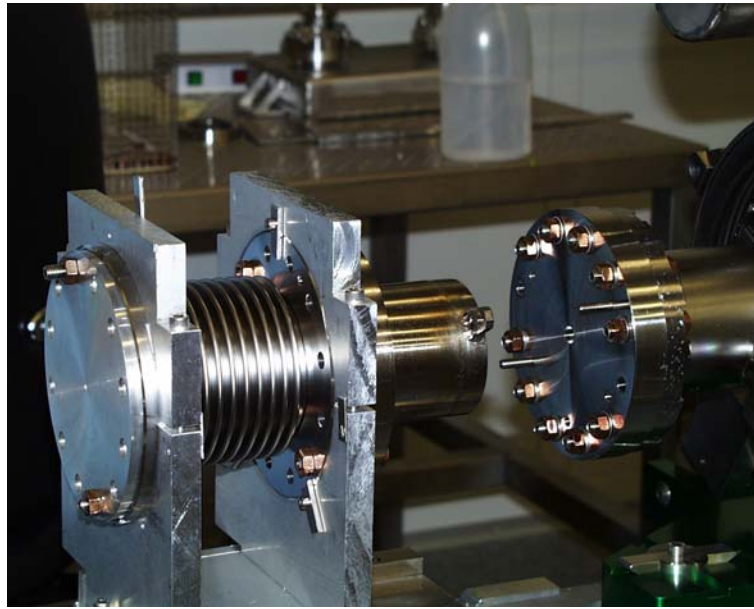


Connect the 8th Cavity to the BPM, then to the Quadrupole and finally to the Gate Valve [Sub-Unit]
(Class 10 Cleanroom)



Continue to interconnect 7 cavities with bellows







November 05

**MP9 building floor
space is cleaned out to
accommodate CAF
Infrastructure**



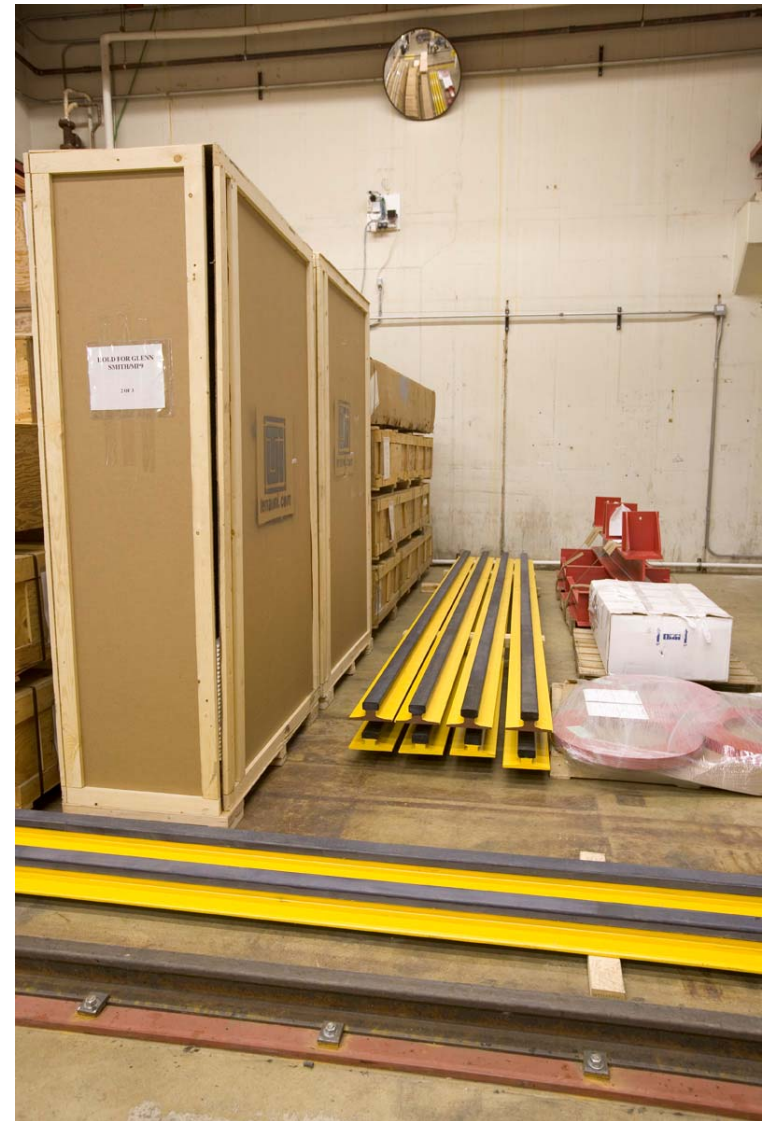
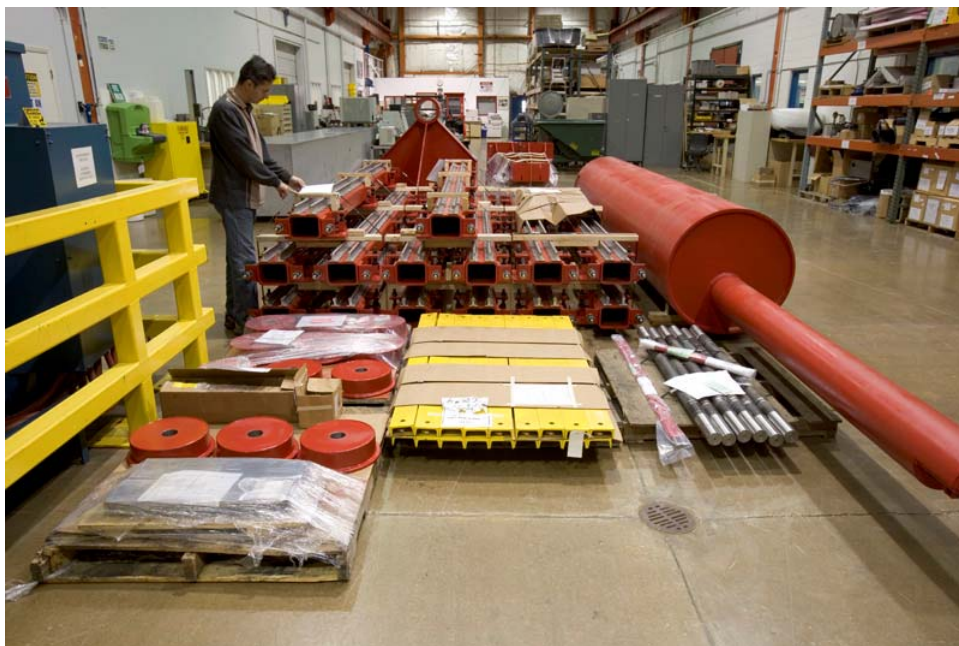
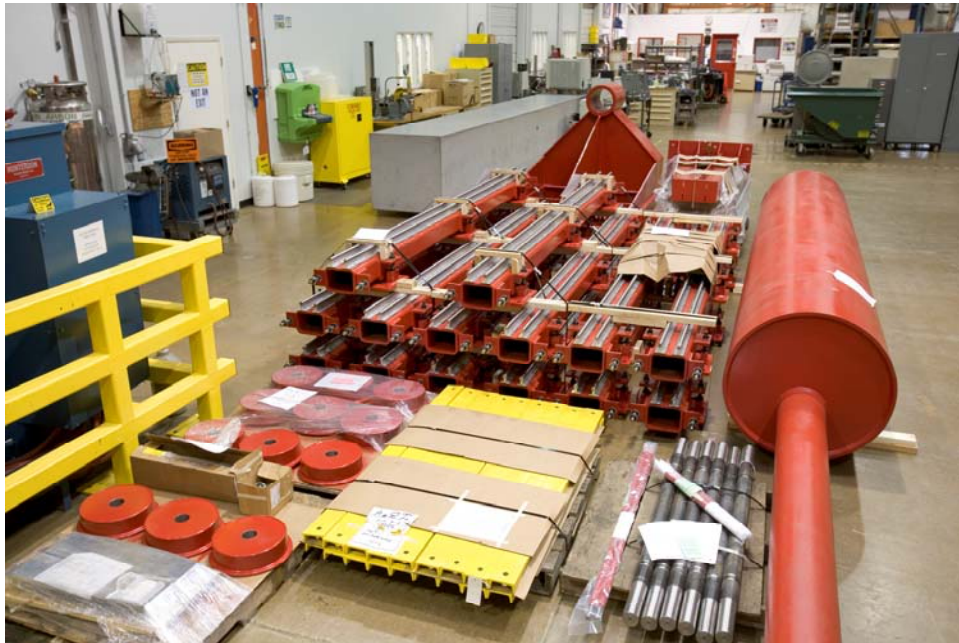
August 05



Current Procurement Status

- **Cavity String Assembly Rail System: \$85K**
 - Received, currently stored at IB4
- **Cold Mass Assembly Fixture: \$31K**
 - Except the strongback, all other parts are received.
 - Strongback will be in house by the middle of December 05
- **Vacuum Vessel Assembly Fixture: \$105K**
 - 50% received
 - Remaining of the parts will be in house by thanksgiving.

Total: \$221K Spent/Obligated in FY05





Cavity String Assembly Clean Room Procurement

- Pre-design meeting was held with the vendor at FNAL on October 7, 06
- Design is currently under progress:
 - Drawings: Luwa is finishing them by the end of this week (November 11)
 - The structural framing portion will be completed by the end of next week (November 18)
- There will be a two weeks long lab-wide design review
- After the review, vendor will proceed to purchase the material to fabricate the clean room components
- Construction is planned to start by the beginning of January 06
- 60 days construction period
- Commissioning during the first week of March 06
- (\$957K) Obligated in FY05



FY06 Procurement Plans for CAF

- MP9 Building Floor Epoxy coating (\$25K)
- Construction of the clean rooms: (\$80K)
 - T&M work to tie the clean rooms to the MP9 house power (\$20K)
 - Fire sprinkler tie-in (\$5K)
 - Metasys DDC Controls network for the clean rooms (\$5K)
 - Clean room consultant services (\$25K)
- Complete remaining fixturing: (\$225K)
 - Cavity String Assembly Fixturing ~30 fixtures
 - Additional Fixturing & Tooling
- UPW (\$20K)
- Equipment & components for the clean rooms: (\$125K)
 - Vacuum hardware (\$50K)
 - Clean room attire & furniture (\$25K)
 - Ultrasonic cleaner (\$40K)
 - Portable clean room (\$10K)
- Miscellaneous (\$40K)

Total: \$450K



FY07 Plans

- High Pressure Water Rinse Setup (HPR)
 - ☐ Design (FY06)
 - ☐ Procure (FY06)
 - ☐ Install (FY06-FY07)
 - ☐ \$125K
- UPW system for HPR (\$30K)